Raytheon

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Improving System Requirements Quality Through Application of an Operational Concept Process: An Essential Element In System Sustainment.

Systems Engineering Process Discussion Topics

1. **DOD Requirements Generation System (RGS) Overview (15 April 2001 – CJCSI 3170.01B)**
2. **Requirements Quality (RQ) – A Key Program Process Element**
3. **Development of an Operational Concept Road Map**
4. **Sustainment Engineering & Technology Management**
5. **DOD Operational Concept (OC) Process Suggested Modification**

1. DOD Requirements Generation System (RGS) Overview

- RGS Document Commonly Used Acronyms
- Mandatory – Multi Component Document CJCSI 3170.01B (15 April 2001)
- Life Cycle Project Requirements Document Development
- Requirements & Acquisition Interface Comparison
- Capstone Requirements Document (CRD)
- CRD Required Capabilities – IERs & Interoperability
- Capstone Requirements Document KPP Development
- DOD CJCSI 3170.01B RGS Process Possible Short Comings

RGS Document Commonly Used Acronyms

- JROC -- Joint Requirements Oversight Council
- PoC – Point of Contact
- C4ISR -- Command, Control, Communications, Computers, Intelligence, Surveillance, & Reconnaissance
- MNS -- Mission Needs Statement
- CRD -- Capstone Requirements Document
- KPPs – Key Performance Parameters
- IERs – Information Exchange Requirements
- SoS -- System of Systems
- FoS -- Family of Systems
- ORD -- Operational Requirements Document
- CONOPS – Concept of Operations

Mandatory – Multi Component Document (CJCSI 3170.01B – 04/15/01)

- Replaces Rev A Dated 10 August 1999
- JROC Secretary PoC for Joint Staff For MNS, CRDs, and ORDs Submission, Handling, and Review
- Guideline For Conduct of Requirements & Program Reviews At Each Program Milestone
- Focus on Visibility, Recognition, & Accommodation of Joint Requirements Opportunities and Interoperability Issues

Process For Streamlining DOD Requirements Generation …

Life Cycle Project Requirements Document Development

❖ Component of the DOD Decision Support Systems

- ❑ Produces Info For Decision Makers On The Projected Mission Needs of the Warfighter

- MNS – Broad Terms
  - Validation Means "Potential" New Concept/System Material Solution Must Be Considered
  - Kick-Off CRDs for ORDs
- CRDs – ORD development guidance
  - Validation through Performance-Based Overarching Capabilities For a Mission Area That Forms A System-of-Systems or Family of Systems.
- ORDs – Translates the MNS & CRDs
  - Details & Refines The Performance Capabilities & Characteristics of a Proposed System
  - Provide the Specific Requirements Base For Acquisition Management System & the Planning, Programming, and Budgeting System (PPBS)

Striving For An Accurate & Traceable Program Road Map …

Requirements & Acquisition Interface Comparison

❑ 2001 Model - New

- Determination of Mission Need
  - Mission Needs Statement (MNS)
  - Complete MS A
- Concept & Technology Development
  - Capstone Requirements Doc (CRD) – If Required
  - Operational Requirements Document (ORD)
  - Complete MS B
- System Development & Demonstration
  - ORD Update (if required)
  - Decision Review (if required)
  - ORD Update
  - Complete MS C

❑ 1999 Model - Traditional

- Determination of Mission Need
  - Mission Needs Statement (MNS)
  - Complete MS 0
- Concept Exploration
  - Capstone Requirements Doc (CRD) – If Required
  - Analysis of Alternatives (AOA)
  - Operational Requirements Document (ORD)
  - Complete MS I
- Program Definition & Risk Reduction
  - AOA Update (if required)
  - ORD Review
  - Complete MS II

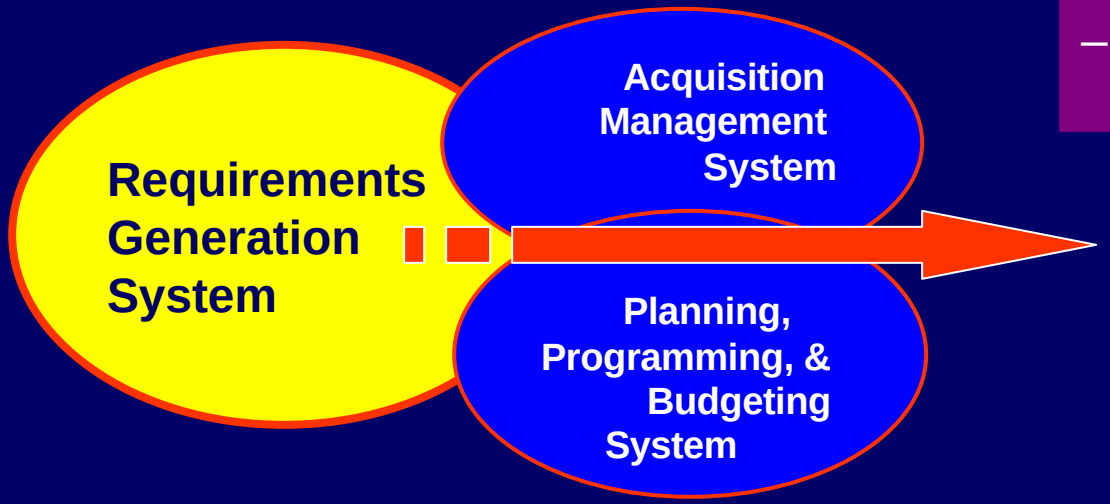
Requirements & Acquisition Interface Comparison

❑ 2001 Model - New

- **Production & Deployment**
  - **Full Rate Production Review**
  - **Initial Operational Capability** (IOC)

❑ 1999 Model - Traditional

- **Engineering & Manufacturing Development (E&MD)**
  - **ORD**
  - **Complete MS III**
- **Production, Deployment & Operational Support**
  - **Initial Operational Capability** (IOC)



❖ ***FUTURE*** **RGS**

➲ **Joint DOD Requirements**

❑ **CR4ISR**

❑ **Interoperability**

➲ **Time Phased Req'ts**

❑ **COTS Acquisition**

Decreased Acquisition Milestones Supports Evolutionary Acquisition …

Capstone Requirements Document (CRD)

- **Identifies**
  - Operational Concepts
  - Overarching Capabilities
  - Req’ts For Mission Area FoS/SoS
  - Scope of Individual Systems Envisioned To Compose the FoS/SoS
  - Criteria Against Various Combinations of FoS/SoS and The Contributions of Individual Systems
  - Factors That Drive The Timing Of Req’ts
    - ✓ System Retirement
    - ✓ Expected Emergence of A New Threat

- **Document Development**
  - Expands Upon Capabilities and Deficiencies Identified In the MNS
  - Attempts To Tie Together Requirements In Multiple MNSs/ORDs
  - Define Operational Capability, Threat, Existing Systems Shortcomings, & Capabilities Required
  - Use Analysis Approach
    - ✓ Weigh In Results & Insights From Previous Assessments
    - ✓ Operational Experience
    - ✓ DT & OT Experience
    - ✓ Deployment Lessons Learned
    - ✓ Technology Demonstrations

CRD: A System Level CONOPS? (if Required) …

CRD Required Capabilities – IERs and Interoperability

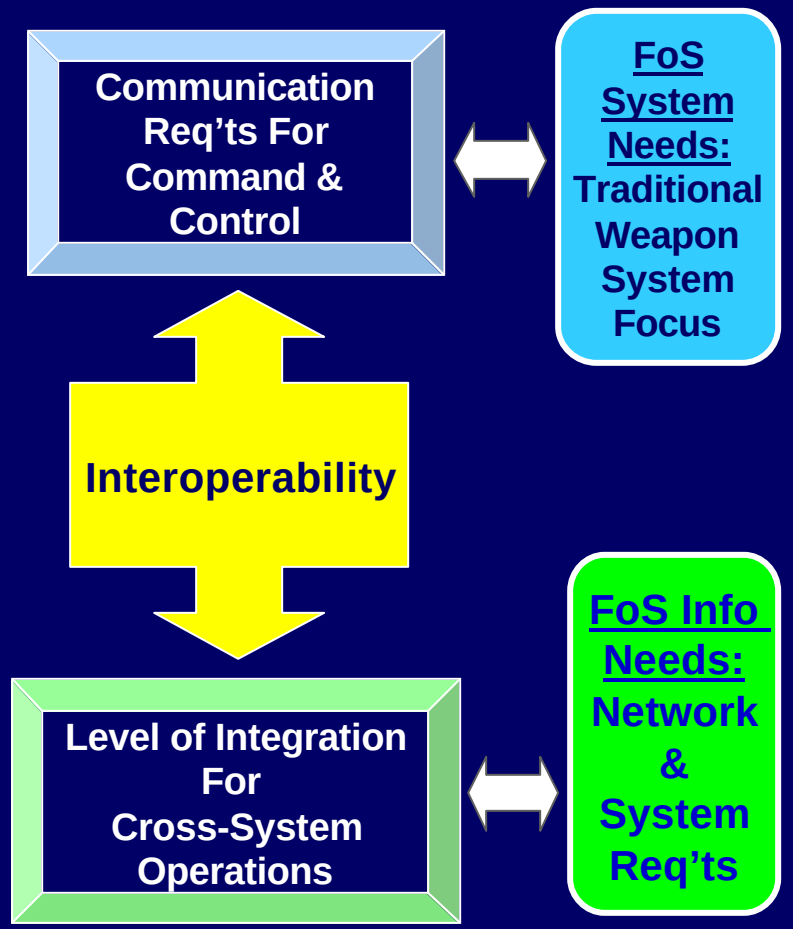
Information Exchange Requirements (IERs)

- Warfighter Information Elements Between 2 Activities
- Establish Basis & Measure for FoS/SoS Interoperability KPP
  - Threshold (T)
  - Objective (O)

Define Interoperability Requirements

- Ability of Systems, Units, or Forces to Provide Services To & Accept Services From Systems, Units, or Forces, and to Use the Services Exchanged to Enable Systems, Units, or Forces to Operate Effectively Together.
- Focus on Information Exchange & Level of Interoperability For The CRDs Systems Information Needs

Guidance For Future ORD C4ISR Development & Legacy System Issues

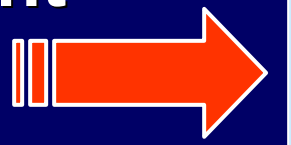


Capstone Requirements Document KPP Development

Key Performance Parameter (KPP)

- A Capability or Characteristic So Significant That It Is Essential For Defining The FoS/SoS Required Capabilities
  - Limited In Number
  - Output-Oriented
  - Threshold (T) / Objective (O) Format
  - Measurable To Facilitate Analysis

- **KPP Development Suggested Steps**



- List Req’ts For Each Operational Element Identified Under Operational Capabilities.
- Prioritize The Supporting Req’ts For Each Element.
- For Each Element, Build One Measurable Performance Parameter That Captures Primary Req’t.
- Repeat For All Identified Operational Elements.
- Identify Most Critical Parameters To The CRD Mission Area – These Are The KPPs!

DOD CJCSI 3170.01B RGS Process Possible Short Comings

- "System-of-Systems" or "Family of Systems" Road Map is Buried in a Lower Process (i.e., inside Capstone Requirements Doc)…
- No References or Guidelines On Writing Good, Testable Requirements…
  - *Assumes Everyone Creating These Documents Knows How to Write "Good" Requirements!*
- CRD Not Mandatory For ORD Development…
  - *CONOPS Document May Never Be Written!*
- Systems In EMD Phase Are Exempt From RGS Process Incorporation & CRD Development …
  - *Most Systems Engineering Requirements Deficiencies Surface During FCA & PCA Just Prior To LRIP Go Ahead!*

2. Requirements Quality (RQ) – A Key Program Process Element

- **Definition & Distinction of Requirements**
- **Systems Engineering (SE) Environmental Impacts Effect RQ**
- **Requirements Quality Degradation Factors**
- **Good Requirements Generation – An Achievable Goal**
- **Good Systems Engineering Requirements References**

Definition of Requirements

- **A Requirement is:**
  - A Characteristic That Identifies The Accomplishment Levels Needed To Achieve Specific Objectives Under A Given Set Of Conditions.
  - A Binding Statement In A Document or In A Contract.
- **Three Basic Requirement Types**
  - Functional – Specifies the Necessary Task, Action, or Activity That MUST Be Accomplished or ‘What’ the System or One of Its Products Must Do…
  - Performance – Specifies ‘How Well’ the System or One of its Products Must Perform A Function Along With Existing Conditions…
  - Constraint – Legal, Legislative, Political, Policy, Procedural, Moral, Technological, or Interface.
- **A Derived Requirement is:**
  - A Further Refined Primary Source Requirement or From a Higher Level Derived Requirement.
  - A Requirement That Results From Choosing A Specific Implementation For A System Element.

Source Data -- Systems Engineering Guidebook: A Process For Developing Systems & Products -- James N. Martin …

Definition of Requirements

- **Stakeholder Requirements**
  - Stated In Non-Technical Terms (e.g., Needs, Wants, Desires, & Expectations) and Are Not Normally Adequate For Design Purposes. Usually Not Verifiable By Technical Verification Techniques.
  - Provide Measures Of Effectiveness For End Item Deliverables
- **Technical Requirements**
  - Derived From Stakeholder Requirements
  - Stated In Clear, Unambiguous, and Measurable In Technical Terms
  - Verifiable And Directly Traceable To Stakeholder Requirements
  - Define The Technical Problem To Be Solved

Source Data -- Systems Engineering Guidebook: A Process For Developing Systems & Products -- James N. Martin …

Requirements Distinction

- **Requirements Versus Design**
  - Requirements deal with 'What' is Acceptable To A Stakeholder – Thresholds & Objectives. Defines The "Problem Space".
  - Design deals with 'What' is Achievable Through The Application of Technology. Design is Literally A Concept of the Mind, An Invention, Created To Meet A Need. Defines The "Solution Space".
- **Requirements Versus Specifications**
  - Requirements Document the Needs of Various Stakeholders.
  - Specifications Are Documents That Contain the Requirements That Have Been Agreed Upon With A Particular Set of the Stakeholders.
- **Validation And Verification**
  - Validation Ensures The Requirements Are Consistent and Complete With Respect To Higher Level Requirements.
    - ✓ Ensures You Are Working the *Right Problem!*
  - Verification Ensures The Selected Solution Meets Its Specified Technical Requirements And Properly Integrates With Interfacing Products.
    - ✓ Ensures You Have Solved the *Problem Right!*

Source Data -- Systems Engineering Guidebook: A Process For Developing Systems & Products -- James N. Martin …

SE Environmental Impacts Effect Req'ts Quality (RQ)

- **Education, Management, & Company Culture Directly Influence The Requirements Definition Process**
  - **"Why Johnny Can't Write Requirement's"**
    (Ivy Hooks - AIAA Associate Fellow & Charter Member of INCOSE)
    - **American Cultural Forces That Inhibit "Doing It Right The First Time"**
      - ***Fear of Asking Questions -- I Might Appear Dumb***
      - ***Let's Hurry Up And Get It Done -- Surf's Up***
      - ***Improvisation -- The American Way***
      - ***Making Mistakes Is OK -- 80/20 Rule***

Source Data – Customer-Centered Products (Hooks & Farry) …

Requirements Quality Degradation Factors

- **Requirements Definition Process Erosion**
  - Technical Inexperience & Inadequate Design Knowledge
  - Poor Technical Reasoning
  - Miscommunication Among IPT Members
  - Hidden Assumptions & Agendas
- **Corporate Requirement Management Myths**
  - Everyone KNOWS What the Project Is About.
  - Everyone KNOWS How To Write Requirements.
  - We Already Have A Requirements Management Process In Place.
  - Everyone UNDERSTANDS Our Requirements Management Process.
  - NOTHING Can Be Done About BAD Requirements.
- **Management’s LACK of Commitment To The Req’ts Definition Process**

Source Data – Customer-Centered Products (Hooks & Farry) …

Good Requirements Generation – An Achievable Goal

Requirements Generation Process

1. **SCOPE THE PRODUCT By Defining Needs, Goals and Objectives, Mission or Business Case, High Level Operational Concepts, Customer Requirements, Constraints, Schedules, Budgets, Authority, and Responsibility.**
2. **Develop CONOPS – Scenarios For How The Your Product Might Behave & Be Used.**
3. **Identify Interfaces Between Your Product and the Rest of the World, Clarifying Your Product's Boundaries, Inputs, and Outputs.**
4. **Write Requirements To Guide Product Design Toward What Your Customers Need and Want.**
5. **Capture Rationale – Reason For the Requirement's Existence. Expose BAD Assumptions and Incorrect Facts.**
6. **Level Requirements – System to Subsystem. Ensure All Requirements Are Written At the Correct Abstraction Level and Can Be Traced Back To Their Origins.**

Source Data – Customer-Centered Products (Hooks & Farry) …

Good Requirements Generation – An Achievable Goal (cont)

Requirements Generation Process (cont)

7 Assess Verification of Each Requirement. Identify The Verification Technique, Facilities, and Equipment Required.

8 Format Requirements and Supporting Document Resources So the Development Team Can Reference This Material.

9 BASELINE Requirements After Validating That They Are: Correct, Complete, Consistent, & Meet The Project Scope Without Gold Plating.

- PROCESS is Sequential and Iterative.
- Must Perform Each Step To Eliminate Errors.
- Prevents Requirements Errors From Propagating.

Source Data – Customer-Centered Products (Hooks & Farry) …

Good Systems Engineering Requirements References

- "What is a Requirement?" – Richard Harwell, et al, 3rd Annual NCOSE International Symposium – 1993.
- "Anatomy of the Engineering Of A System" – Richard Harwell, Jerry Lake, John Velman, and James Martin. 6th Annual NCOSE International Symposium – 1996.
- "Writing GOOD Requirements" – Ivy Hooks, 4th Annual NCOSE International Symposium – 1994, Volume 2.
- "The PMTE Paradigm: Exploring the Relationship Between Systems Engineering Process and Tools" – James N. Martin, 4th Annual NCOSE International Symposium – 1994.
- "Systems Engineering: A Way of Thinking, A Way of Doing Business, Enabling Organized Transition From NEED to Product" – AIAA/INCOSE Joint Project Paper – August 1997.

Good Requirements Generation: An Essential Project Element …

3. Development of an Operational Concept Road Map

- Operational Concept Definition
- Operational Concept Guideline History
- Operational Concept Document (OCD) Purpose
- OCD: A Program's "Interactive" Storybook
- Operational Concept Document Intended Users
- Operational Concept Document (OCD) Content
- OCD Content Establishes A Concept of Operations
- OCD Scenarios: Key Systems Engineering Element
- *Scenario Components: Key SE Parts For The OCD*
- Operational Concept Road Map Summary

Operational Concept Definition

- **Operational Concept (OC):**
  - **Shared Vision Between System Program Stakeholders**
    - ✓ **Addresses 'How' The System Will Be Developed, Produced, Deployed, Trained, Operated, Maintained, Refined, And Decommissioned.**
  - **Involves A Systems Engineering Process**
    - ✓ **Constructs a series of scenarios from different stakeholder viewpoints (customer, maintainer, operators, developers, testers, system engineers/architects, managers, etc.).**
      - ***Each Scenario Addresses A Stake holder's Desired Intent To USE, DEPLOY, & REPAIR The SYSTEM***
      - ***Scenarios Are Refined Over Time As More Information About the System is Collected.***
    - ✓ **Integrates the Life Cycle-Based Scenarios into a Composite System Behavioral Timeline With Internal and External System Inputs/Outputs For Each Stakeholders Interactive Product Viewpoint.**

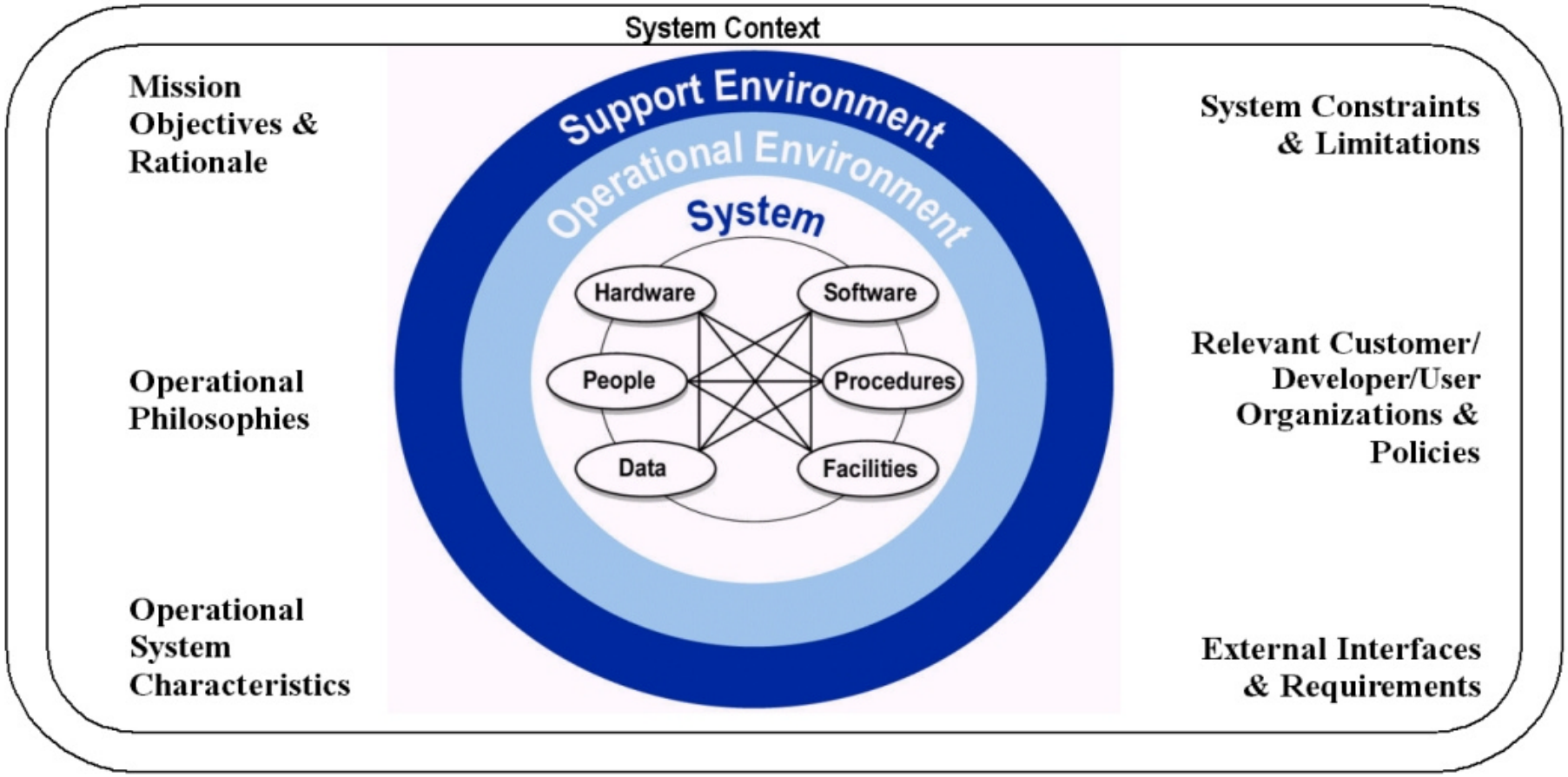
Operational Concept Guideline History

- **January 1980 – Robert J. Lano TRW**
  - *A Structured Approach For Operational Concept Formulation (OCF)*
    - ✓ Recognized That Operational Concept Formulation (I.E., Defining System Goals, Missions, Functions, and Components) Was Important to the Success of a System Development and Would Have an Impact on the Overall System Design and Development Process.
    - ✓ Lano IEEE Paper Published in 1985
      - IEEE Computer Society Press Tutorial, "System and Software Engineering" by R. H. Thayer and M. Dorfman.
- **1985 - Defense Joint Logistics Commanders (JLC) produced a Joint Regulation**
  - Management of Computer Resources in Defense Systems.
    - ✓ Includes DoD-STD-2167 with a DID DI-MCCR-80023 Called "*Operational Concept Document* "
- **January 1991 – ANSI & American Institute of Aeronautics and Astronautics (AIAA) Starts A OCD Guideline**
  - January 1993 -- Guide for the Preparation of Operational Concept Documents – ANSI/AIAA G-043-1992 Published

Operational Concept Document (OCD) Purpose

- Context for Requirements (What) Development
  - Statement of Mission Requirements
  - Establishes A Timeline of System Usage.
  - Establishes Expected System Behavior.
  - Provides A Product Life Cycle Communication Vehicle For Requirements Capture & Evaluation Across All Project Disciplines.
- A "Living" Document
  - Supplemented With System Simulations and Executable Product Usage Scenarios

Operational Concept Document (OCD) Purpose

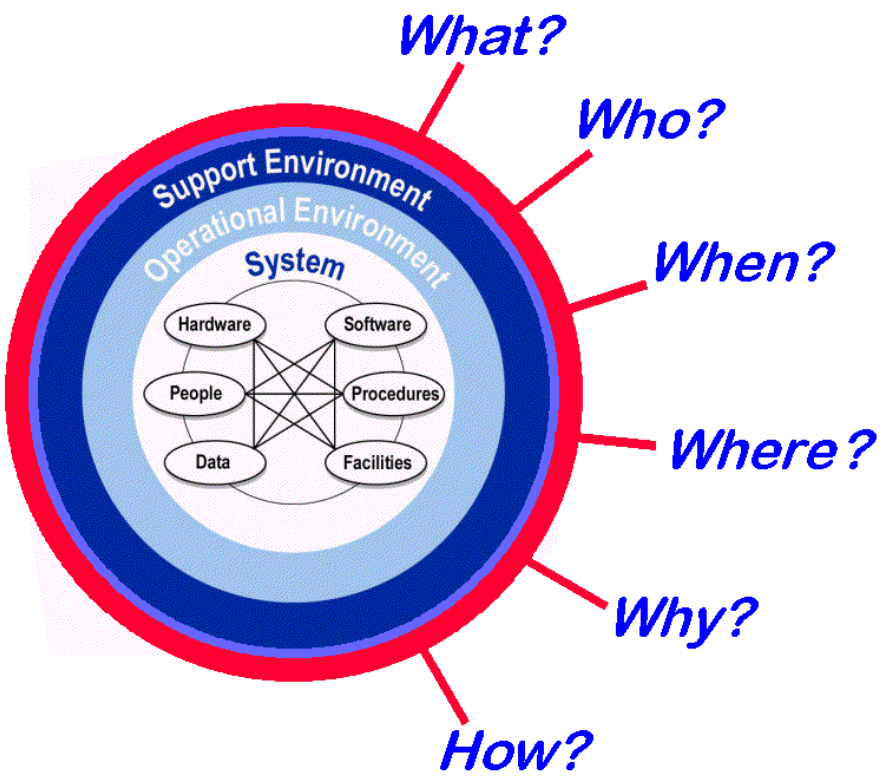


ANSI/AIAA G-043-1992 – OCD Guide: Being Updated By AIAA SETC/INCOSE ...

OCD: A Program's "Interactive" Storybook

- **"Communicates A Story" of User's Point of View on What, Who, When, Where, Why, and How a Product is Used.**
  - **What – Known Components, Elements, and Top Level Capabilities That Perform The Necessary System Functions.**
  - **Who – Product's Interaction Among Various Human Elements Within A System & External Interfaces. Scenarios Should Identify Decision Point Authorities.**
  - **When – Description of Activities, Tasks, Flows, Precedence, Concurrencies…Time/Sequence Related Elements Necessary To Achieve Mission Objectives in Various Product Modes & Conditions.**
  - **Where – Product's Geographical & Physical Locations in a Customer's Facilities & Interfacing Systems.**
  - **Why – Provides Rationale To Clarify The Reader's Understanding For Specific Events Found In Operational Concept Scenarios.**
  - **How – Expectation On Product Usage, Operation, and Maintenance in a Given Environment. Emphasis on 'Concepts' & Avoidance of System Design or Implementation.**

Operational Concept Document Intended Users




Customers


Maintainers


Managers


System Engineers (Architects)


Operators


Developers


Testers

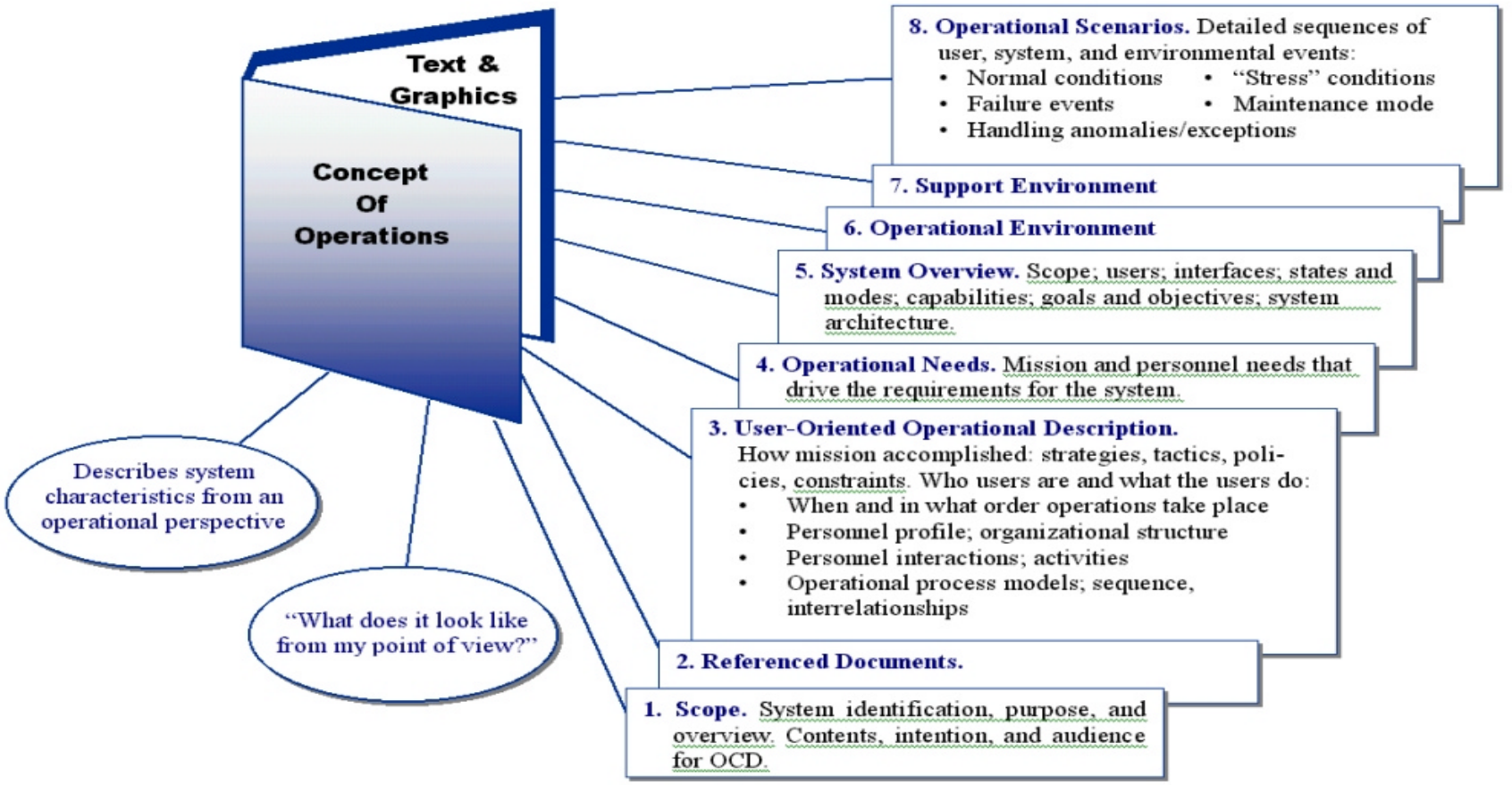

Information Consumers

ANSI/AIAA G-043-1992 – OCD Guide: Being Updated By AIAA SETC/INCOSE…

Operational Concept Document (OCD) Content

1. Scope
2. Referenced Documents
3. User-Oriented Operational Description
4. Operational Needs
5. System Overview
6. Operational Environment
7. Support Environment
8. Operational Scenarios

OCD Content Establishes A Concept of Operations



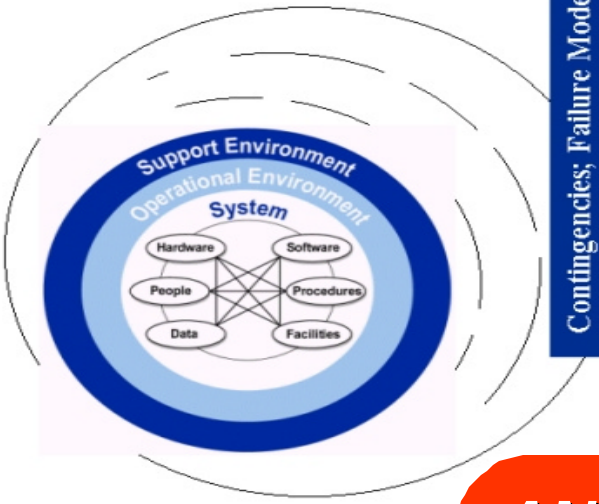
ANSI/AIAA G-043-1992 – OCD Guide: Being Updated By AIAA SETC/INCOSE

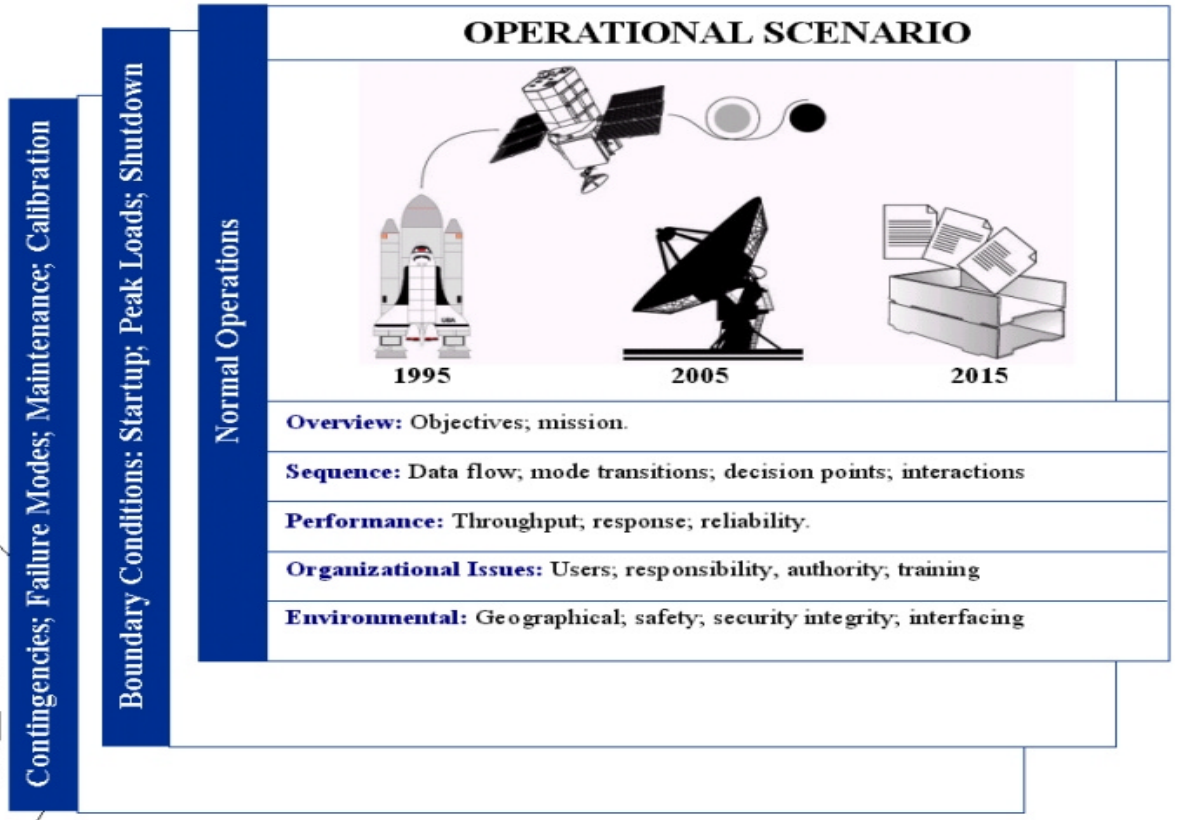
OCD Scenarios: Key Systems Engineering Element

- Summary of what the system is (context), what it is to do in general (mission), and how it will do it.
- OCD Scenario Content:
  - Provide A System Sequence
    - ✓ Data Flow, Mode Transitions, & Decision Points (particularly human interactions).
  - Establish System Performance
    - ✓ Response Time, Delay points/times, Throughput/turnaround times expected, & Reliability, Availability, Maintainability.
  - Map Out Organizational Issues
    - ✓ User Types and Technical Expertise, User Training Constraints, and User / Operator Responsibilities and Decision Authority.
  - Identify System Environment and Existing Facilities
    - ✓ Environment in which system must operate, Geographical issues, Safety, security, system integrity needs, and Interfacing systems description and data flows.

OCD Scenarios: Key Systems Engineering Element

Captures Operations under typical and *stressful* conditions (e.g., maximum I/O rates and loads, minimum personnel staffing, and element failure modes)

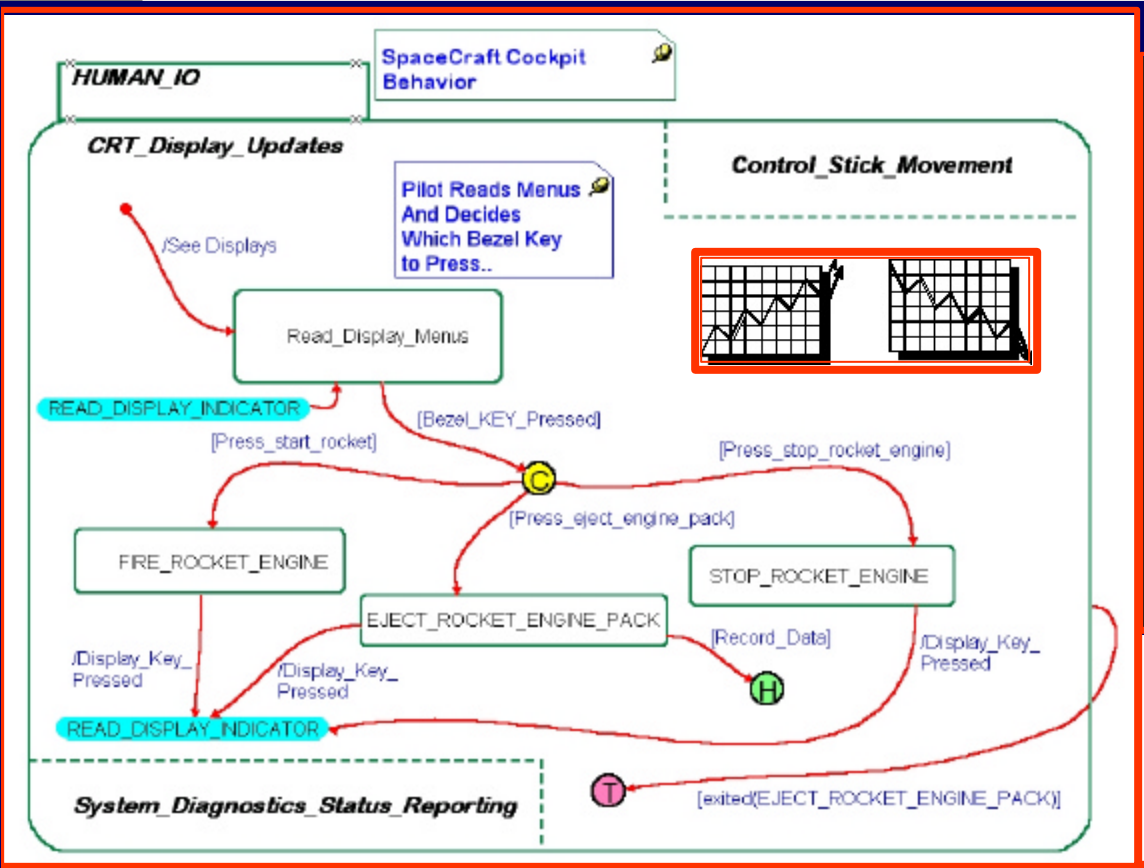


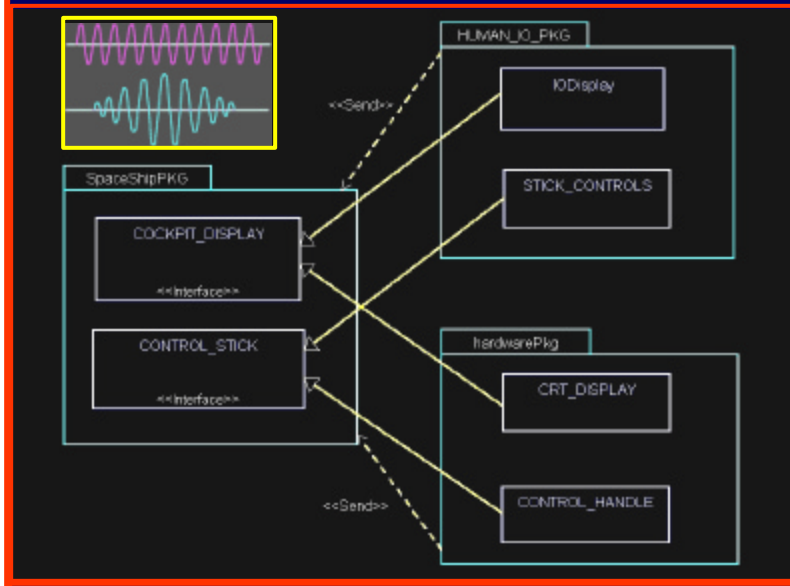


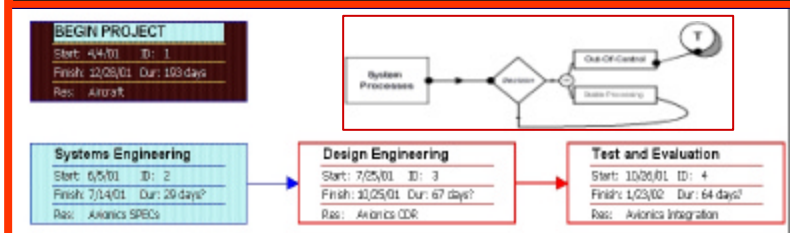
Must Determine Functional Flows Against A Life Cycle System Behavioral TimeLine!

ANSI/AIAA G-043-1992 – OCD Guide: Being Updated By AIAA SETC/INCOSE

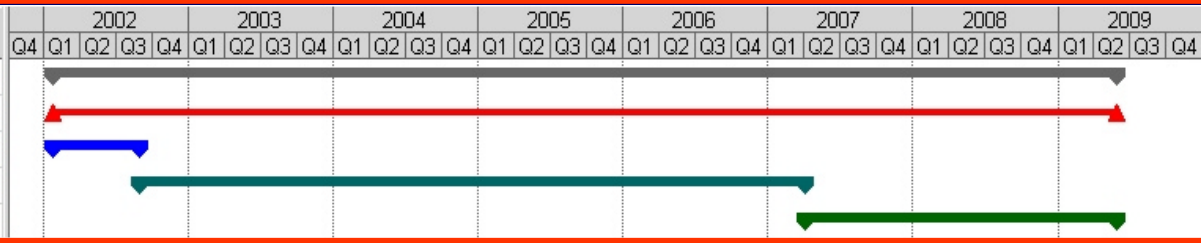
Scenario Components: Key SE Parts For The OCD







	Task Name	Duration
0	AIAA SETC	1917 days
1	Aeronautics Project	1917 days
2	MNS, Capstone, ORD SE Process	157 days
6	RFI_RFP SE Process	1200 days
15	EMD to LRIP SE Process	560 days



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Operational Concept (OC) Road Map Summary

- Simple, Cost-effective Process Approach to Build a Consensus Among All Program Stakeholders & Discover Early 'Missing' Requirements.
- Aids In Early Identification of the Two Largest Classes of System Requirements Error Categories:
  - 1) Missing Requirements.
  - 2) Conflicting Requirements
- Operational Concept Scenarios Deliver Positive Requirements Definition Process Attributes(1)
  - 1) Provides Ease of Requirements Generation and Understanding
  - 2) Brings Resolution to Often Emotional Requirements Debates
  - 3) Facilitates Completeness of System Requirements
  - 4) Identifies User Interface Issues
  - 5) Provides an Early Basis for Requirements Validation
  - 6) Establishes a Foundation for Product Verification

Reference(1) Customer-Centered Products – Hooks & Farry

4. Sustainment Engineering & Technology Management

- **Sustainment Engineering**

- **Sustainability & Technology Management Operational Concept (OC)**

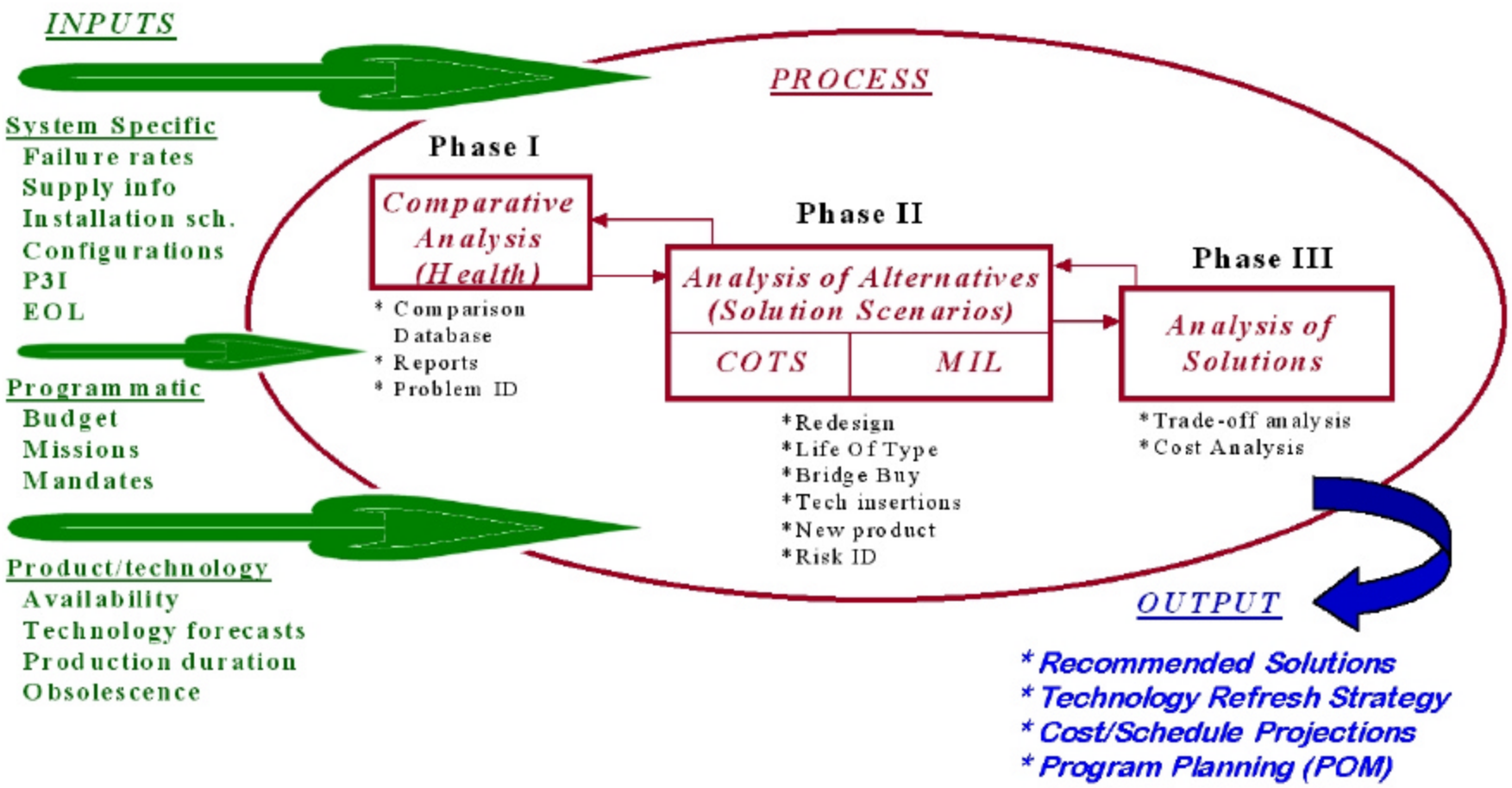
Sustainment Engineering

- **Designing, Developing and Maintaining a Required Operational Capability Over the Desired Period of Time at an Affordable Price**
  - **Repair/Rebuild**
  - **Maintenance**
  - **Supply Management**
  - **Technology Management**
    - ✓ **Technology Refresh**
    - ✓ **Technology Insertion**
    - ✓ **Technical Obsolescence Risk Management**
  - **Innovative Support Concepts**

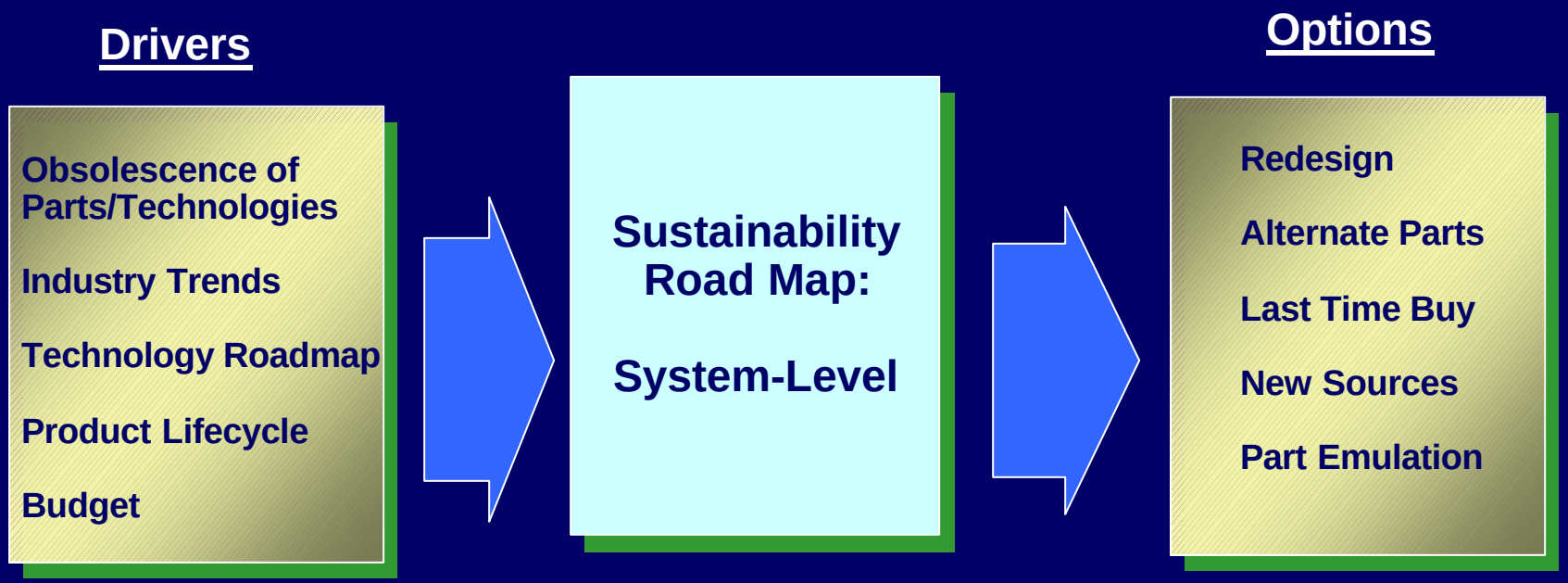
Sustainment Engineering

- **Process Methodology**
  - **Focus On Sustainment Cost Reduction**
    - ✓ **Optimizing the Mix of Build-to-Print and Commercial Products While Applying Cost, Readiness, and Performance Factors**
  - **Surgical Insertion of Appropriate Technology and Support Concepts Across A Product or Family of Products Life Cycle**
  - **Reduction of Technology Obsolescence Risks**
  - **Lowering Total Ownership Costs, Increasing Affordability, Improving Availability and Maintaining Mission Readiness**

Sustainment Engineering



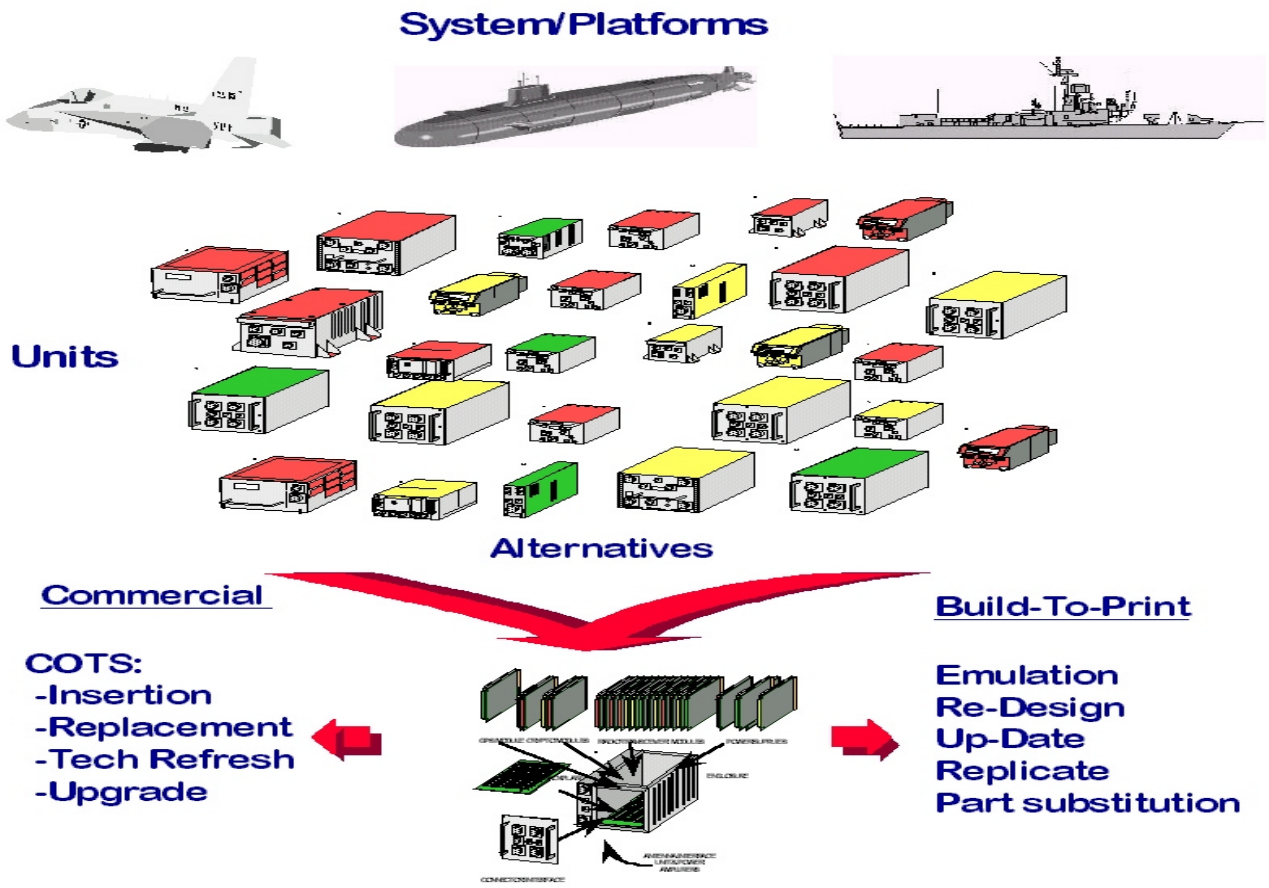
Sustainability and Technology Management OC



Affordable Sustainment Engineering System Level Considerations …

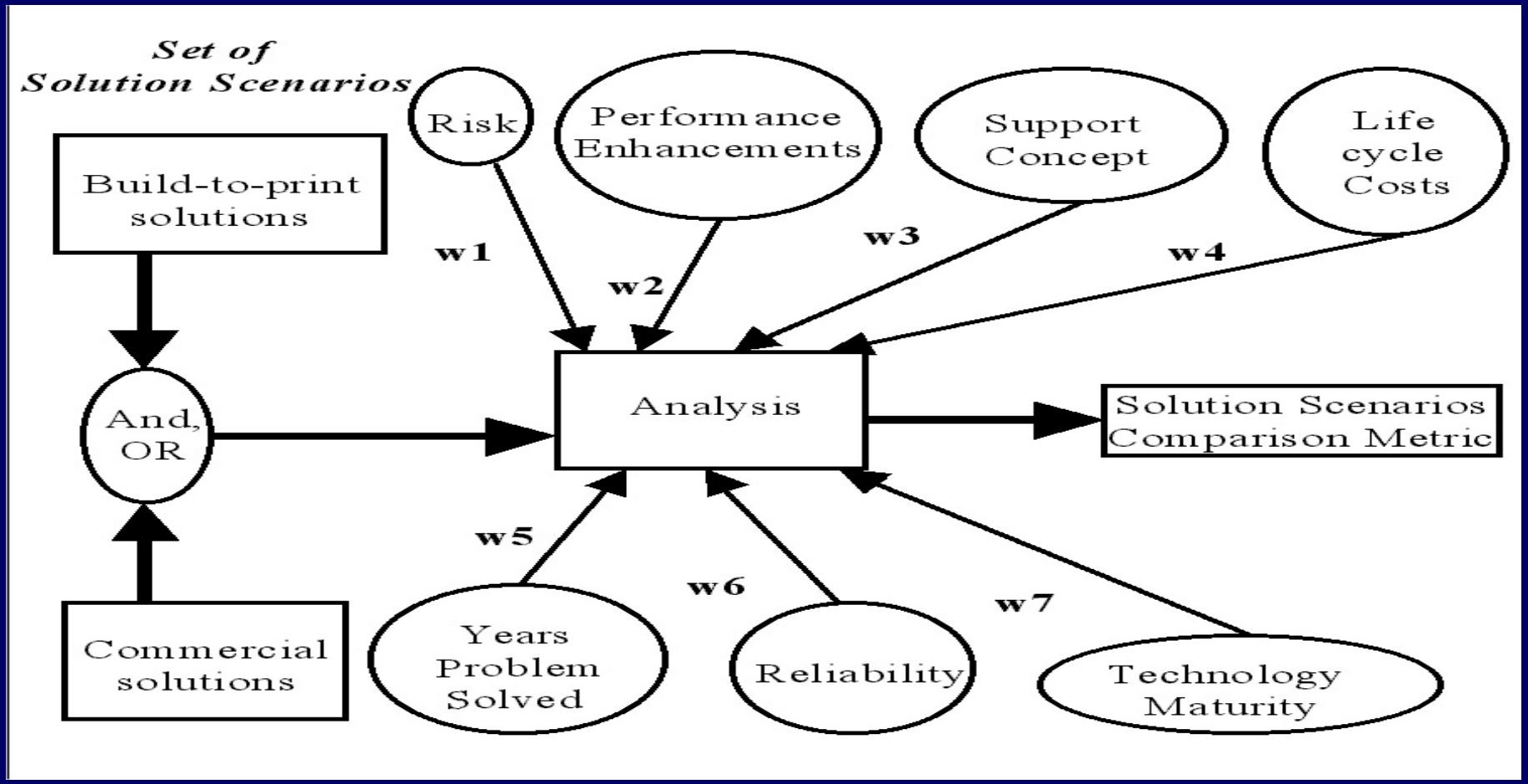
Sustainability and Technology Management OC

Sustainment: COTS versus Built-To-Print !



Sustainability and Technology Management OC

Sustainment Engineering is a Scenario-Based Process !



Sustainability and Technology Management OC

System Sustainability is a Function of Design For Supportability Combined With A Proactive Obsolescence Management Plan……

Design for Supportability

- Part and Supplier Selection
- Complete Design Documentation
- Flexible, Robust Design
- Open System Architecture

Proactive Obsolescence Management

- Monitor Obsolescence Drivers
- Predict Future Obsolescence
- Plan Response Before Obsolescence Occurs
- Integrate Obsolescence Management With Product/Technology Roadmaps
- Multi-Year Buys
- Supplier Configuration Control

5. DOD Operational Concept (OC) Process Modification

- DOD Requirements Generation System (RGS) Needs To **Incorporate a "Requirements Quality" Guideline Section**
- DOD RGS Needs A Life Cycle Flow Modification To **Require A Capstone Requirements Document** On All Programs (Independent of Program Phase)
- Capstone Requirements Document Needs To **Include Timeline Scenario-Based CONOPS** from All User ViewPoints
  - Capstone CONOPS Scenarios Must **Address Interoperability FoS/SoS Requirements**
- **Sustainment Engineering** Must Become A Capstone CONOPS Element Focusing On COTS & Technology Obsolescence

RGS Process Modification Will Provide Better Life Cycle Return-On-Investment

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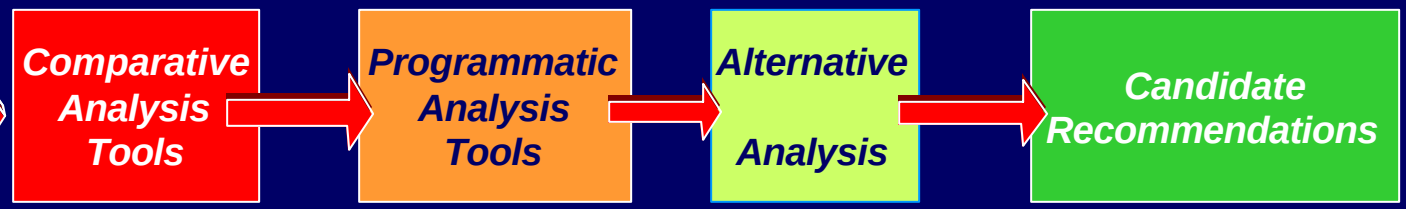
5. DOD Operational Concept (OC) Process Modification

Budget
Missions
COTS Mandates
Equipment Projections

Move The Sustainment Process & Planning To The CRD & CONOPS Process Level!

Deployment and Production Factors

Reliability
Availability
Cost
Obsolescence
Configurations



Technical and Support Alternatives

COTS
NDI
New Concepts
New Technologies

Technology Insertion Candidates
Life Cycle Logistics Concepts
Technology Refresh Approach

RGS Process Modification Will Provide Better Life Cycle Return-On-Investment

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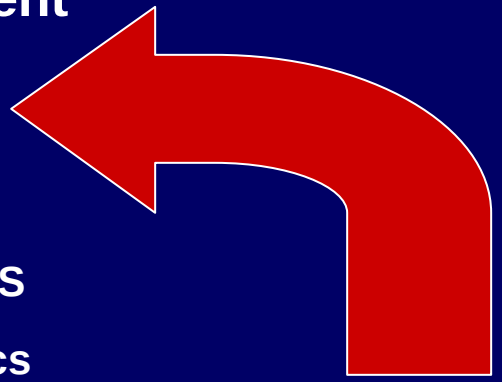
5. DOD Operational Concept (OC) Process Modification

Incorporate Proactive Obsolescence Management Process Into The Capstone Requirements Document (CRD) Process…..

- ❑ Develop Operational Scenarios For The CRD
- ❑ Generate Sustainment ORD KPPs Req'ts From CONOPS
- ❑ Flow Sustainment Requirements Into Product PID Specs



Design for Supportability

- Part and Supplier Selection
- Complete Design Documentation
- Flexible, Robust Design
- Open System Architecture

Proactive Obsolescence Management

- Monitor Obsolescence Drivers
- Predict Future Obsolescence
- Plan Response Before Obsolescence Occurs
- Integrate Obsolescence Management With Product/Technology Roadmaps
- Multi-Year Buys
- Supplier Configuration Control

RGS Process Modification Will Provide Better Life Cycle Return-On-Investment

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